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ABSTRACT

To investigate how the number of years students spend studying academic subjects affects their achievement, this study compiled data from a nationwide longitudinal study of 58,000 high school students begun in 1980, and from 1982 College Board testing files. Years of instruction in seven subject areas were related, using statewide averages, to verbal and mathematics achievement test scores. Populations compared were students in academic, general, and vocational tracks, in New York, Pennsylvania, Ohio, Illinois, California, and Washington, and those taking and not taking college admission tests. It was found that (1) New York and Pennsylvania students received more academic instruction than those in the other states; (2) the pattern of test scores related inconsistently to that of course taking; (3) among SAT takers that completed any of three achievement tests, New York students registered both the most courses and the highest aptitude and achievement scores; (4) verbal and math aptitude scores and course taking all related similarly to achievement scores in New York and California; and (5) course offerings and requirements and tracking policies strongly affect students' exposure to course content. (MCG)

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Course Taking and Achievement: Findings and Implications for Curricular Policy

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Course Taking and Achievement:
Findings and Implications for Curricular Policy

During the past year there has been considerable public attention focused on high school graduation requirements, most notably the report and recommendations issued by the National Commission on Excellence in Education (1983). This Commission recommended that high school students complete four years of English, three years of mathematics, three years of science, three years of social studies, one half year of computer science, and for the college bound, two years of foreign language. Such a set of requirements, it was surmised, would help stem the tide of declining test scores and set American students on a path toward greater achievement and excellence. Other reports (National Science Board Commission on Precollege Education in Mathematics, Science and Technology, 1983; Boyer, 1983) have published similar recommendations. Likewise, numerous states have either strengthened graduation requirements or are in the process of revising them (Parrish, 1983); and 27 state colleges and universities have toughened their admissions requirements (Thomson, 1982).

Despite this flurry of activity aimed at requiring students to take more academic coursework, little evidence has been produced about students' actual course taking patterns and the assumed linkage between time spent in courses and students' achievements. This study begins to provide such data.

Using data from High School and Beyond, a national longitudinal study commissioned by the National Center for Education Statistics and begun in 1980, and 1982 College Board data, this paper

1) compares academic course taking by high school seniors across six states—New York, Pennsylvania, Illinois, Ohio, California, and Washington;

2) compares seniors' performance on achievement and aptitude tests across these states;

3) provides an initial assessment of the effects of academic course taking on student performance; and

4) considers implications of the findings for curricular policies.

In addition, an integral part of the study is to account for selection factors which may influence course taking, achievement, and the relationship between the two. We recognize that the degree to which course taking affects achievement depends on such variables as the student's high school track, whether he or she is college bound, and general aptitude. Therefore we have organized the data analysis according to certain choices students make.

We begin by examining course taking practices and achievement measures by high school track: academic, general, and vocational. Next we look at the college bound, comparing course taking and achievement measures among students who have completed college entrance examinations and those who have not. We then describe course taking and achievement measures of the more select group of SAT takers who complete at least one College Board Achievement Test. Thus, we move from an examination of the total group of high school seniors to more selective subgroups. Finally, we compare the effects of course taking on achievement between two states, taking into account verbal and math aptitude.

Aside from policy implications, this study continues a line of investigation focused on the effects of time spent learning on student performance. Furthermore, the results bear on the theoretical work undertaken by Harnischfeger and Wiley (1981) which postulates that time spent learning along with pupil characteristics are the "sole direct determinants of achievement."

While this study focuses on quantity of coursework, it is fully understood that content, teaching strategies, and other variables also are critical determinants of achievement. Nevertheless, they must remain outside the scope of this study.

Data Sources

High School and Beyond is a national longitudinal study of students who were sophomores and seniors in 1980. The nationwide sample consists of 28,000 seniors and 30,000 sophomores. These students completed a series of cognitive tests and answered an extensive questionnaire covering high school experience, attitudes, and plans for the future. The survey was conducted by National Opinion Research Center, Chicago.

Data on magnetic tape were obtained from New York, Pennsylvania, Ohio, Illinois, and Washington. California supplied tabulations and statistics as requested. All these states had sample sizes sufficiently large to produce state level estimates. Washington and Illinois funded augmentations in order to achieve large enough sample sizes.

The College Entrance Examination Board furnished two data tapes for New York and California. These data included test scores plus students' responses to the Student Descriptive Questionnaires, which they complete when applying to take the SAT. Students indicated the number of years of coursework they have had plus whether they have been in honors and/or advanced placement courses. Therefore, for New York and California we obtained both High School and Beyond and College Board data.

Course Taking and Achievement by Track

Differences among states in mean years of academic coursework and in mean achievement test scores can arise in three different ways. First, there are differential proportions of students in the academic curriculum, and these students generally have more academic coursework and higher test scores than students in the other tracks. Therefore, differences in means can result from differences across states in the composition of the student populations when academic course taking in each track is constant. Secondly, means vary when

the composition of students is similar, but academic course taking varies. Third, means vary across states when there are differences in both the composition of the student population and academic course taking in each track. In the sections that follow, we will see examples of all three sets of circumstances.

Although statistics are partitioned by track, it is important to recognize that tracks are not necessarily the same in different states. Each state has its own policies regarding encouragement of students to enter the various tracks, and standards for coursework in each track. Therefore, students' experiences in a single track may be quite different as one moves from state to state.

Course Taking

Mean years of coursework in all academic subjects across all six states are shown in Table 1. New York and Pennsylvania students had the most coursework in most subjects and the highest total years of academic coursework. On the average, students in the other four states take 1-2 years less of coursework than New York and Pennsylvania students. Washington and Illinois had the least total coursework.

Table 2, which shows the percent distribution of students across tracks, provides some clues for understanding Table 1. It should be noted that the three states with highest academic coursework also have the largest proportions of academic students--New York, Pennsylvania, and Ohio. Since these students tend to take more academic courses, a high proportion of them can inflate the statewide mean.

Aside from this point, the most pronounced differences among states are in the proportions of students in academic and general tracks. The size of the vocational track is fairly constant. New York and Washington display

Table 1

Mean Years of Academic Coursework During Grades 10-12,
Reported by 1980 Seniors, by State

	NY	PA	IL	OH	CA	WA
English/Lit.	3.1	3.1	2.9	2.9	2.8	2.7
History/Soc. Stud.	2.7	2.7	2.1	2.5	2.3	2.4
French	.4	.3	.3	.3	.3	.3
German	.1	.1	.1	.2	.1	.3
Spanish	.8	.6	.6	.5	.7	.5
Mathematics	2.3	2.3	1.9	2.0	1.9	1.8
Science	2.1	1.9	1.6	1.6	1.6	1.6
Total	11.4	11.0	9.5	9.9	9.7	9.5

Source: High School and Beyond data files for states indicated.

Table 2

Percent Distribution of 1980 Seniors Across High School Track, by State

Track	Nation	NY	PA	IL	OH	CA	WA
Academic	39	51	44	36	46	39	28
General	37	26	25	39	25	44	50
Vocational	24	23	32	25	29	17	23
Total	100	100	101	100	100	100	101

Note: Percentage rounded to nearest percent and may exceed 100.

Source: High School and Beyond 1980 data files for states indicated; Peng, S. S.; Fetters, W. B.; Kolstad, A. J. High School and Beyond: A capsule Description of High School Students. Washington, D. C.: National Center for Education Statistics, 1981.

almost opposite proportions of academic and general students. In New York, over half the students are academic, and in Washington about half are in the general program. In other words, the typical New York student is academic, and the typical Washington student is in the general track. It is notable that states with the highest proportions of academic students are found in the east, and those with most general track students are in the west.

Total academic coursework by state and track is shown in Table 3. New York and Pennsylvania students receive the most instruction, not just because of the proportion of academic students, but also because they obtain the most coursework within each track. Academic students living in New York and Pennsylvania receive, on the average, one year-long academic course more than their counterparts in the other states. Differences across tracks are also clear. Academic students take 2 to 2 1/2 year-long academic courses more than general students, and general students (except in Washington) study about one year- long course more than vocational students. It is important to recognize that general and vocational students may have as much or more coursework as academic students, but they take more non-academic courses.

Table 4 compares mean years of academic coursework across states and tracks. The numbers represent years of coursework during grades 10 through 12. In terms of English, New York and Pennsylvania students had the highest overall averages, with a little over three years. Likewise, these were the only two states where students received three years of English regardless of track membership. California and Washington were the only states where academic students had less than three years of English. Comparing states in terms of discrepancy among tracks, California showed the most degradation in English across tracks. Vocational students there take on the average one-half year less of English, which amounts to about 90 days less of instruction.

New York and Pennsylvania students spent the most time studying social

Table 3

Mean Total Academic Course Taking During Grades 10-12, Reported by 1980 Seniors, by Track and State

	NY	PA	IL	OH	CA	WA
Academic	12.9	12.6	11.1	11.5	11.3	11.5
General	10.5	10.3	9.0	9.3	8.9	8.8
Vocational	9.1	9.2	7.9	7.9	7.9	8.5

Includes English/Lit., history/soc. studies, French, German, Spanish, mathematics, and science.

Source: High School and Beyond data files for states indicated

Table 4

Mean Years of Academic Coursework During Grades 10-12, Reported by 1980 Seniors by Track and State

	NY	PA	IL	OH	CA	WA
English/Lit.						
Academic	3.1	3.1	3.1	3.1	2.9	2.9
General	3.1	3.1	3.0	2.9	2.7	2.7
Vocational	3.0	3.0	2.8	2.7	2.5	2.7
History/Soc. Stud.						
Academic	2.8	2.8	2.1	2.6	2.4	2.4
General	2.6	2.8	2.1	2.6	2.3	2.4
Vocational	2.6	2.6	2.0	2.2	2.1	2.4
Foreign Lang.[1]						
Academic	1.9	1.7	1.4	1.4	1.6	1.6
General	1.0	.6	.8	.7	.9	.7
Vocational	.6	.4	.5	.4	.6	.6
Mathematics						
Academic	2.7	2.7	2.5	2.4	2.4	2.5
General	2.0	2.1	1.7	1.7	1.7	1.6
Vocational	1.6	1.8	1.5	1.6	1.5	1.5
Science						
Academic	2.5	2.5	2.1	2.1	2.0	2.1
General	1.8	1.7	1.4	1.3	1.3	1.5
Vocational	1.3	1.4	1.2	1.1	1.2	1.3

[1]Sum of French, German, and Spanish.

Source: High School and Beyond data files for states indicated.

studies, and Illinois students spent the least time, a little over two years. Among academic students, New York and Pennsylvania had the highest mean years and Illinois the least. The greatest discrepancy among tracks was found in Ohio where vocational students take about .4 years less or 72 days less social studies than academic students take.

Foreign language study definitely is dominated by academic students. New York and Pennsylvania academic students had the highest mean years of language study.

Roughly two years of math is typical. Among academic students, New York and Pennsylvania were highest in mean years and Ohio and California the lowest, spending about one third year less time in math. Vocational students generally spend about a year less in math courses.

It is significant that New York and Pennsylvania academic students studied science almost one half year more than did academic students in other states.

Generalizing, the states can be divided into three groups. With few exceptions, New York and Pennsylvania students spent the most time in academic coursework regardless of track, and these states have the highest proportions of academic students. Illinois, Ohio, and California have more moderate proportions of academic students and their within track course taking is somewhat less than that of New York and Pennsylvania students. Also these three states had the lowest course taking among vocational students in English, social studies, and science. Washington is somewhat of an anomaly because it ties with Illinois for the lowest total course taking; yet within-track, across- state comparisons reveal that Washington students do not always have the lowest course taking, for instance in social studies, foreign language, and science. This paradox is explained by the fact that Washington has the lowest proportion of academic students, thus deflating its statewide

averages.

To determine if mean years of coursework varied beyond that which could be attributed to sampling error, an analysis of variance of mean years of English, mathematics, and science was calculated. A two way analysis was used with state and track as the two factors. The results indicated that mean years of coursework in all three subjects were found to be significant across both state and track. The interaction of state and track, however, was significant only for English and mathematics but not science. This means that English, mathematics, and science coursework were significantly different across tracks, and the differences for science were constant across the states. For English and mathematics, however, track differences were not constant across states.

Summary: Course Taking

In general, New York and Pennsylvania students showed the most years of academic instruction when compared to the other four states. Part of the reason for higher overall averages is that both these states had relatively high proportions of academic students who took more coursework than students in other tracks, thus raising the states' overall mean. Composition of student population is not the only explanation, however. Ohio students were distributed across tracks at about the same proportions as Pennsylvania, yet course taking means were generally lower for all tracks. Therefore some difference in statewide mean years of coursework can be attributed to differential distribution of students across tracks, and some differences reflect actual variations in years of coursework.

Academic students in New York and Pennsylvania were most likely to have more instruction in English, history/social studies, mathematics, science, and foreign language than students in the other four states. California academics

were likely to have the least amount of mathematics and science instruction. The differences in course taking among states have important consequences regarding preparation for college entrance examinations and college attendance. New York and Pennsylvania students spent one third to one half years or about 60 to 80 days more studying science, mathematics, and foreign language than did their counterparts in most of the other four states. Potentially, students from states where more coursework is encouraged or required will have an advantage as they enter the national pool of college bound students.

Achievement

Test scores are shown in Tables 5 and 6 for Total Verbal, Math 1, and Math 2. The total verbal score reflects the sum for Vocabulary 1, Vocabulary 2, and Reading. These three tests had 15, 12, and 20 items respectively for a total of 47. Washington and New York show the highest mean Total Verbal scores. Washington's performance is notable considering the fact that Washington had the lowest proportion of academic students across the six states and had the lowest mean years of English or literature.

Within each track state-by-state scores are similar. The biggest differences can be seen across tracks. However, an analysis of variance determined that there were significant differences in Total Verbal scores across states and across track.

New York students scored the highest in both Math 1 and Math 2, but all states were fairly close to the national average of 50. Again state by state differences are not nearly as great as differences across tracks. It is noteworthy that Washington students had the highest verbal scores and lowest English course taking plus relatively lower math scores and lowest math coursework. While this pattern appears to be illogical, it is consistent with

Table 5

HSB Verbal Scores of 1980 Seniors
by Track and State, 1900

	NY	PA	IL	OH	CA	WA
All	26.14	24.76	24.66	25.15	24.83	26.19
Academic	29.87	29.30	29.35	28.52	28.79	30.40
General	23.20	21.43	22.28	23.15	22.51	24.73
Vocational	21.47	20.73	20.24	21.15	21.15	23.80

Note: Scores are number correct summed across Vocabulary 1, Vocabulary 2, and Reading.

Source: High School and Beyond data files for states indicated.

Table 6

HSB Math 1 and Math 2 Scores of 1980 Seniors
by Track and State

	NY	PA	IL	OH	CA	WA
Math 1						
All	52.75	50.81	50.60	51.03	50.91	50.38
Academic	57.14	56.29	55.58	55.31	56.04	56.32
General	49.99	46.55	48.35	48.00	47.64	48.10
Vocational	46.37	46.09	46.50	46.37	46.46	47.65
Math 2						
All	52.44	50.71	50.72	51.12	50.39	50.24
Academic	56.70	55.36	55.15	55.01	54.78	55.67
General	49.31	46.50	48.48	48.36	47.48	48.23
Vocational	46.80	46.97	47.45	47.06	46.99	47.37

Note: Scores are standardized with mean 50 and standard deviation 10.

Source: High School and Beyond data files for states indicated.

prior research which has found verbal scores to be much less dependent on school learning variables than are math scores. Verbal scores tend to be influenced by extra reading and other activities that occur outside the classroom.

In general, academic students score about one half standard deviation above general students. Differences between general and vocational students are not as large. An analysis of variance indicated that scores did not vary significantly across states but were significantly different across tracks. The pattern of state and track (the interaction) was not a significant factor.

It should be noted that the previous analysis of variance of academic coursework had found that both state and track were significant factors in explaining differences in mean years of coursework; however, the same pattern did not emerge for test scores. Only for Total Verbal scores was state a significant factor. Otherwise just the track factor was significant. Thus, regardless of the fact that these states varied in years of coursework, the mean math scores did not vary to a significant degree. Conclusions regarding the direct relationship between math coursework and math performance must await further analysis.

Course Taking and Achievement: The College Bound

Before examining course taking and test scores of college bound seniors, it is instructive to compare the six states with regard to the distribution of students who take a college entrance examination. Table 7 displays the percentage of students in each state who took at least one examination and the percentage who did not. These results are based on two questions contained in the High School and Beyond survey.

In order to determine whether these numbers capture most of the college bound in each state, the 1982-83 College Handbook was consulted. In all

Table 7

Percent Distribution of 1980 Seniors who Reported Taking at Least One College Entrance Exam, by State

	NY	PA	IL	OH	CA	WA
Took SAT, ACT, or both	69	51	65	59	45	37
Did not take test	31	49	35	41	55	63

Source: High School and Beyond data files for states indicated.

states, except Washington, all major and minor public four-year universities require the SAT or ACT. In California, for instance, not only the University of California, but also the California State Colleges and California State Universities require an admissions test score. In Washington, most state universities require an admissions test, but the Washington Pre-College Test score can be substituted. Therefore, to the extent that students substituted the state test score, we do not have as complete a record for Washington students. Nevertheless, since among the six states, Washington had the smallest proportion of academic students, the 37% reported as taking a college entrance exam probably encompasses most college bound students.

One other discrepancy was noted. In New York, the City Universities of New York do not require an admissions test score, whereas the City Colleges of Illinois (in Chicago) do. This may explain the high percentage of test takers in Illinois.

Also, the reader will note that the percentage of test takers in each state is higher than those shown for the academic track. Although not included here, the High School and Beyond data reveal that some general and vocational students decided to take a college entrance exam too. Obviously, the track categories are not rigid, and some general and vocational students attend college as well.

Course Taking

Generally, the course taking patterns shown in Table 8 for college bound and non-college bound mirror the difference between academic and non-academic students. New York and Pennsylvania students, both the college bound and non-college bound, complete more academic coursework on the average than students in the other four states. One exception is foreign language, for which New York and California students had the highest averages. Among college bound

Table 8

Mean Years of Coursework, During Grades 10-12, Reported by 1980 Seniors, by College Entrance Exam, and by State

	NY	PA	IL	OH	CA	WA
English/Lit.						
All	3.1	3.1	2.9	2.9	2.8	2.7
SAT and/or ACT	3.1	3.1	3.0	3.1	2.9	2.8
None	3.0	3.0	2.8	2.7	2.6	2.7
History/Soc. Stud.						
All	2.7	2.7	2.1	2.5	2.3	2.4
SAT and/or ACT	2.7	2.7	2.1	2.6	2.4	2.4
None	2.6	2.7	2.0	2.3	2.3	2.4
Foreign Lang.						
All	1.3	1.0	1.0	.9	1.1	1.0
SAT and/or ACT	1.6	1.5	1.2	1.3	1.6	1.3
None	.6	.5	.5	.4	.7	.8
Mathematics						
All	2.3	2.3	1.9	2.0	1.9	1.8
SAT and/or ACT	2.5	2.6	2.2	2.3	2.3	2.1
None	1.7	1.9	1.4	1.5	1.7	1.6
Science						
All	2.1	1.9	1.6	1.6	1.6	1.6
SAT and/or ACT	2.3	2.3	1.8	1.9	1.9	1.9
None	1.5	1.5	1.2	1.2	1.3	1.5

Source: High School and Beyond data files for states indicated.

students, Washington students had the least coursework in English and mathematics; and Illinois college bound students had the least preparation in history, foreign language, and science.

Discrepancies between college bound and non college bound were greatest in foreign language, mathematics, and science. In foreign language, for instance, the difference ranged from one-half year in Washington to one year in New York. In mathematics and science, college bound students completed .6 to .8 years more coursework. While Washington college bound students sometimes had the least coursework, the non-college bound did relatively better in course taking. Thus the discrepancy between college attenders and non-college students was smaller in Washington than in any of the other states. One might say the balance between excellence and equity favors equity in Washington.

Achievement

Table 9 displays High School and Beyond test scores for students who reported taking a college entrance exam and for those who did not. Generally, differences across states are small, whereas differences between test and non-test groups are large.

Washington and New York students earned the highest verbal scores, a finding similar to that reported for academic students. Since Washington students had the least English coursework, their performance is surprising. However, it should be recalled that only 37% of Washington students compared to 69% of New York students fall in the college bound category. This implies that the Washington students are a more select group than the New York college bound. Washington and California students were the least discrepant in terms of the performance of college bound vs non-college bound.

For both Math 1 and Math 2, New York and Pennsylvania college bound

Table 9

HSB Verbal and Math Scores of 1980 Seniors
by College Entrance Exams and by State

	NY	PA	IL	OH	CA	WA
Total Verbal						
All	26.14	24.76	24.66	25.15	24.83	26.19
Took SAT and/or ACT	28.65	28.58	27.04	27.74	27.82	28.70
Did not take test	20.61	20.49	20.09	21.17	22.25	24.67
Math 1						
All	52.75	50.81	50.60	51.03	50.93	50.38
Took SAT and/or ACT	56.05	55.34	53.45	54.17	55.13	53.90
Did not take test	45.42	45.71	45.15	46.22	47.37	48.30
Math 2						
All	52.44	50.71	50.72	51.12	50.39	50.24
Took SAT and/or ACT	55.36	54.73	53.03	53.81	54.32	52.89
Did not take test	45.94	46.03	46.28	47.10	47.09	48.66

Total Verbal is the sum of Vocabulary 1, Vocabulary 2, and Reading.

Source: High School and Beyond data files for states indicated.

students obtained the highest scores. On both tests, California students scored very close to Pennsylvania students, even though they (California) students receive about one third year less math instruction. Again the explanation lies with the differential percentages of college bound. California college bound may be somewhat more select (45%) compared to those from Pennsylvania (51%). Washington and Illinois college-bound students performed least well on the math tests, and they had the least mathematics preparation.

In math, college bound students scored about one-half standard deviation above the national average, and non-college bound scored .2 to .5 standard deviations below. Also California and Washington showed the least discrepancy between their college and non-college bound, and this is consistent with course taking patterns as well.

Course Taking and Achievement: Achievement Test Takers

We turn now to the College Board data to examine the coursework of Achievement Test Takers. Table 10 summarizes courses for New York and California test takers, including all test takers, those who completed the Aptitude Test only, and those who completed at least one Achievement Test.

Similar to High School and Beyond results, differences in mean years of English among test groups and among the two states are not large. Achievement Test takers completed slightly more coursework in social studies, and New York students on the average studied social studies one third of a year more than California students. This amounts to a difference of about 60 days instruction. This difference is consistent with HSB data reported in Table 8.

Achievement Test takers spent about one half year more studying math than Aptitude Test takers, and California Aptitude Test takers and Achievement Test takers reported about .2 years or 36 days less of math instruction than that

Table 10

Mean Years of Coursework During Grade 9-12, Reported by Scholastic Aptitude Test Takers, 1982 New York and California

	NY	CA
English		
All	3.99	3.96
Apt. Test Only	3.94	3.87
Apt. Test + Ach. Test[1]	4.02	4.03
Social Studies		
All	3.57	3.21
Apt. Test Only	3.51	3.17
Apt. Test + Ach. Test	3.67	3.25
Mathematics		
All	3.54	3.36
Apt. Test Only	3.36	3.19
Apt. Test + Ach. Test	3.96	3.70
Biological Science		
All	1.32	1.33
Apt. Test Only	1.28	1.31
Apt. Test + Ach. Test	1.41	1.36
Physical Science		
All	1.94	1.36
Apt. Test Only	1.81	1.20
Apt. Test + Ach. Test	2.41	1.70

[1]Students who took at least one Achievement Test.

Source: College Board's Admissions Testing Program data, 1982.

reported by New York students. High School and Beyond also revealed a difference of .2 years among New York and California college bound students.

Coursework in biological science was fairly consistent across test groups and the two states. Achievement Test takers in New York reported slightly more time in biology courses.

There were considerable differences in physical sciences. New York Achievement Test takers reported having .6 years or 108 days more physical science coursework than Aptitude Test takers. In California the discrepancy was about one half year between Achievement Test takers and Aptitude Test takers. California students studied physical science about .6 to .7 years less than New York students.

In summary, the greatest differences were found for math, social studies, and physical sciences with Achievement Test takers and New Yorkers consistently having the most preparation.

Achievement

Test scores for English Composition, Math 1 and Math 2 are shown in Table 11. Approximately 76% of the New York Achievement Test takers and 88% of the California Achievement Test takers completed English Composition and Math 1 or English Composition and Math 2. New York students scored higher than did California students on all three tests. Likewise, New York aptitude test scores also were higher. This is partly explained by the fact that a larger percent of California aptitude test takers completed each achievement test. This fact plus other data not shown here indicate that relatively more California students from lower aptitude levels took these achievement tests. Therefore, to some extent differences in scores reflect differences in the aptitude structure of achievement test takers in the two states.

In order to compare the effects of coursework on achievement while

Table 11

Test Scores for Three Achievement Test Populations, by State

	Achievement Score	Verbal Aptitude	Math Aptitude	% of Apt. Test Takers
English Comp.				
NY	526	533	574	18.7
CA	499	488	548	31.2
Math 1				
NY	575	525	580	15.6
CA	520	479	532	26.0
Math 2				
NY	670	569	658	2.4
CA	655	533	638	6.2

Source: College Board's Admissions Testing Program data, 1982.

controlling for aptitude scores, a multiple regression analysis was conducted for each achievement score shown. The independent variables were verbal aptitude, math aptitude, and years of coursework in English, social science, foreign language, mathematics, biological science, and physical science. Using the resulting regression coefficients for each state, predicted scores then were calculated for three types of students--high aptitude and high course taking, average aptitude and course taking, and low aptitude and course taking. The results, shown in Table 12, indicate that the effects of aptitude and course taking on achievement scores are very similar for the two states. A year of coursework and 100 points of aptitude score translate into about the same level of achievement in both New York and California.

We can conclude, therefore, that the differences in achievement scores favoring New York reflect both higher aptitude levels of and course taking by New York students who chose to take English Composition, Math 1, and Math 2. Further analysis is needed to disentangle the effects of course taking and aptitude.

Conclusions and Implications

1. In general, New York and Pennsylvania students received more instruction in the academic subjects than did students in the other four states. In many cases, differences were as great as .3 or .5 years or 60 to 90 days of instruction. With few exceptions, this superiority existed across all tracks and for both college bound and non-college bound students. In terms of their academic students, New York and Pennsylvania school systems devote more in-class time to almost all subjects, potentially giving these students some competitive advantage as they enter the national pool of students who take college entrance exams and compete for places in colleges and universities.

Table 12

Predicted Scores Based on Regression Analysis
Linking Aptitude and Course Variables to Achievement

	Predicted Scores		Predictor Variable Values							
	NY	CA	SATV	SATM	Eng	Socsci	Forlang	Math	Bisci	Physci
English Comp[a]										
High	582	591	600	625	4.2	3.8	3.5	4.2	1.9	2.5
Middle	506	516	512	542	4.0	3.5	3.0	3.8	1.4	2.0
Low	407	418	400	425	3.8	3.0	2.5	3.4	.9	1.5
Math 1[b]										
High	617	605	600	625	4.2	3.8	3.5	4.2	1.9	2.5
Middle	553	548	503	558	4.0	3.5	3.0	3.8	1.4	2.0
Low	442	447	400	425	3.8	3.0	2.5	3.4	.9	1.5
Math 2[c]										
High	730	730	650	725	4.2	3.8	3.5	4.3	1.5	2.8
Middle	658	665	551	648	4.0	3.5	3.0	4.0	1.0	2.5
Low	551	566	450	525	3.8	3.1	2.5	3.7	.9	2.2

Source: The College Board's Admissins Testing Program data, 1982.

[a]Based on 20,585 cases for New York and 27,812 cases for California.

[b]Based on 17,423 cases for New York and 23,068 cases for California.

[c]Based on 2,797 cases for New York and 5,646 cases for California.

Likewise, New York and Pennsylvania general, vocational, and non college bound students receive more preparation in most academic subjects. Compared to students from the other four states, New York and Pennsylvania students have at least some potential advantage as they enter the work world, trade schools, two year colleges, or military service. Although general and vocational students may have less need for subjects such as calculus and physics, the fact remains that these young people must function in a world that rewards communication skills and technological sophistication. Depriving them of instruction in the basic academic courses may have consequences which are just as serious as depriving college bound students.

2. The pattern of test score results was somewhat different from that of course taking. Regardless of their course taking, New York and Pennsylvania students were not consistently the highest scorers on the High School and Beyond tests. Washington had the highest total verbal score along with the lowest English coursework, but New York had the highest math scores and also the highest math course taking. Some of the inconsistency results from differences across states in the distribution of students across tracks. For instance, Washington's relatively small academic and college bound groups appear to be more selective in terms of ability. Also the High School and Beyond tests may not be adequate measures of school achievement, a point raised by other researchers as well (Heyns and Hilton, 1982). Furthermore, we don't really know whether more instructional time is more effective in producing achievement results.

3. Among SAT takers who completed the three achievement tests reported here, New York students reported the greatest amount of course taking and scored the highest on both achievement and aptitude measures. Course taking appears to have made at least some contribution to superior performance by New York students. At this time, however, we cannot determine the magnitude of

the effect of course taking.

4. The effects of verbal and math aptitude and course taking were remarkably stable across New York and California.

5. These findings should provoke state and local policy makers to consider the consequences of course offerings and requirements, policies regarding the encouragement of students to follow various tracks, and the relative advantages and disadvantages of allocating resources to any given track. As shown by the data reported here, such policies have considerable impact on students' exposure to course content.

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